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MICROSTRUCTURAL CHANGES IN THE THYROID GLAND OF THE PREWEANING AND WEANING RATS AFTER HETEROTYPIC STRESS

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Abstract:

Chronic stress modulates the activity of various neuroendocrine axes; while activation pattern of the hypothalamo-hypophyseo-adrenal axis (HHAA) is studied in details, the response of the hypothalamo-hypophyseo-thyroid axis (HHTA) is less understood, especially in terms of its response to different types of stressors by the follicular and parafollicular compartments of the thyroid gland. Recent papers presented data on the inhibitory effect of chronic stress on the HHTA, while exercise and low temperature were shown to be able to activate its function. Most studies were done on the adult experimental animals using genetic studies without consideration of the structural changes in the peripheral link of the HHTA in the growing body. Reports on the effect of the chronic variable stressors on the thyroid gland in early life are scarce, though during this period neuroendocrine axes are extremely sensitive to different adverse factors, such as stress, infection, inflammation and environmental changes. The objective of this research is to assess the microscopic changes in the thyroid gland of the preweaning and weaning rats exposed to chronic heterotypic stress compared to the homotypic one. Homo- or heterotypic stressors were chronically applied to the preweaning and weaning rat pups. After the end of the last stress session the animals were euthanized, thyroid gland was sampled, embedded in paraffin, sectioned and stained for thyroglobulin, calcitonin, proliferative cells nuclear antigen (PCNA) and caspase 3. The mucosa of the alimentary tract of the experimental animals was examined and the thymus and the adrenal glands were sampled and weighed to evaluate the depth of stress-induced changes in the body. Immunologically stained slides of the thyroid gland were assessed using Image Pro+ software. Our study showed that chronic stress resulted in the structural and immunohistochemical changes of the thyroid gland in the preweaning and weaning experimental animals which indicate an inhibition of its function in the type of stress-related pattern. Both homo- and heterotypic stressors caused microscopic alterations in the thyroid gland, the extent of which depended both on the initial age of the experimental animal and the type of the stressor applied. The number and the size of the thyroglobulin-positive cells significantly decreased, and the volume density of the apoptotic cells significantly increased in the heterotypically stressed rat pups of both age subgroups with higher level of significance in the preweaning age subgroup. The number of calcitoninocytes was significantly increased in the weaning rat pups exposed to the heterotypic stress. The number of PCNA-positive cells significantly decreased only in the heterotypic stress group of both ages with higher level of significance in the preweaning age subgroup. A positive correlation was found between the volume density of the thyroglobulin-positive cells and the severity of the accidental thymic involution. Thus, our research demonstrated that weaning period is very sensitive to chronic stress for the thyroid gland of the experimental animals which by this age becomes mature enough to differentially respond to the various types of stress (homotypic versus heterotypic) both by the thyroid follicular and parafollicular compartments, and that thymus plays an important role in the functional capacity of the thyroid gland during stress in early life.

Key words: *Thyroid Gland, Chronic Stress, Weaning Period, Immunohistochemistry, Image Analysis*

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